IN THE CLAIMS

Please add the following new claims.

7. (New) A method for detecting a locked condition of a demodulator operating upon a plurality of QAM signals that each have at least one discrete level that corresponds to one of a predetermined plurality of nominal points in a constellation plane, wherein the demodulator restores the plurality of QAM signals by generating a plurality of effective points in the constellation plane, each one of the plurality of effective points corresponding to one of the plurality of QAM signals, the method comprising the steps of:

(A) defining a plurality of reference areas in the constellation plane, each of the plurality of reference areas being defined between two lines crossing an origin of the constellation plane; and

(B) indicating the locked condition when a percentage of the plurality of effective points generated by the demodulator occurring in the plurality of reference areas is within a range of probability for effective points to occur in the plurality of reference areas when the demodulator is in the locked condition;

wherein step (A) includes a step of defining the plurality of reference areas by a plurality of lines including four lines having slopes of k, 1/k, -1/k, and -k respectively, where k is a real number equal to at least 2;

wherein each one of the plurality of effective points has a first component and a second component, said first and second components corresponding to locations in the constellation plane; and

wherein step (B) includes a step of determining, for each one of the plurality of effective points, whether the one of the plurality of effective points occurs in one of the plurality of reference areas by:

multiplying a minimum value, equal to a lesser of an absolute value of the first component of the one of the plurality of effective points and an absolute value of the second

component of the one of the plurality of effective points, by a number greater than 1 to produce a modified value for the one of the plurality of effective points;

subtracting the modified value from a maximum value, equal to a greater of an absolute value of the first component of the one of the plurality of effective points and an absolute value of the second component of the one of the plurality of effective points, to produce a subtraction value for the one of the plurality of effective points; and

analyzing a sign of the subtraction value to determine whether the one of the plurality of effective points occurs in one of the plurality of reference areas.

8. (New) A circuit that detects a locked condition of a demodulator operating upon a plurality of QAM signals that each have at least one discrete level that corresponds to one of a predetermined plurality of nominal points in a constellation plane, wherein the demodulator restores the plurality of QAM signals by generating first and second quadrature demodulated signals for each of the plurality of QAM signals that define a plurality of effective points in the constellation plane, each one of the plurality of effective points corresponding to one of the plurality of QAM signals, the circuit comprising:

a first absolute value circuit that receives the first quadrature demodulated signal for each of the plurality of QAM signals and generates a first absolute value of the first quadrature demodulated signal;

a second absolute value circuit that receives the second quadrature demodulated signal for each of the plurality of QAM signals and generates a second absolute value of the second quadrature demodulated signal;

a comparison circuit, coupled to the first and second absolute value circuits, that receives the first and second absolute values and generates a maximum value and a minimum value for the first and second absolute values; and

a counter that is enabled to count according to a difference between the maximum value and a product of the minimum value and a multiplication factor, the counter having at least one output indicative of the locked condition.

9. (New) The circuit of claim 8, wherein the comparison circuit further comprises a subtraction circuit to subtract the first absolute value from the second absolute value to generate a phase error.

10. (New) The circuit of claim 8, wherein the circuit further comprises

a multiplication circuit that multiplies the minimum value and the multiplication factor to generate the product; and

a subtraction circuit that subtracts the product from the maximum value to generate the difference.

11. (New) The circuit of claim 8, wherein the counter is an up/down counter having a counting mode selected according to a sign of the difference between the maximum value and the product of the minimum value and the multiplication factor.

12. (New) A system for detecting a locked condition of a demodulator that operates upon a plurality of QAM signals that each have at least one discrete level that corresponds to one of a predetermined plurality of nominal points in a constellation plane, the demodulator restoring the plurality of QAM signals by generating a plurality of effective points in the constellation plane, each one of the plurality of effective points corresponding to one of the plurality of QAM signals, the system comprising:

the demodulator; and

means for indicating the locked condition when a percentage of the plurality of effective points generated by the demodulator occurring in a plurality of reference areas in the constellation plane is within a range of probability for effective points to occur in the plurality of reference areas when the demodulator is in the locked condition, each of the plurality of reference areas being defined between two lines crossing an origin of the constellation plane .

13. (New) A method for detecting a locked condition of a demodulator operating upon a plurality of signals that each have at least one discrete level that corresponds to one of a

predetermined plurality of nominal points in a constellation plane, wherein the demodulator restores the plurality of signals by generating a plurality of effective points in the constellation plane, each one of the plurality of effective points corresponding to one of the plurality of signals, the method comprising the steps of:

(A) defining a plurality of reference areas in the constellation plane, each of the plurality of reference areas being defined between two lines crossing an origin of the constellation plane; and

(B) indicating the locked condition when a percentage of the plurality of effective points generated by the demodulator occurring in the plurality of reference areas is within a range of probability for effective points to occur in the plurality of reference areas when the demodulator is in the locked condition;

wherein step (A) includes a step of defining the plurality of reference areas by a plurality of lines including four lines having slopes of k, 1/k, -1/k, and -k respectively, where k is a real number equal to at least 2;

wherein each one of the plurality of effective points has a first component and a second component, said first and second components corresponding to locations in the constellation plane; and

wherein step (B) includes a step of determining, for each one of the plurality of effective points, whether the one of the plurality of effective points occurs in one of the plurality of reference areas by:

multiplying a minimum value, equal to a lesser of an absolute value of the first component of the one of the plurality of effective points and an absolute value of the second component of the one of the plurality of effective points, by a number greater than 1 to produce a modified value for the one of the plurality of effective points;

subtracting the modified value from a maximum value, equal to a greater of an absolute value of the first component of the one of the plurality of effective points and an absolute value of the second component of the one of the plurality of effective points, to produce a subtraction value for the one of the plurality of effective points; and

analyzing a sign of the subtraction value to determine whether the one of the plurality of effective points occurs in one of the plurality of reference areas.

14. (New) A circuit that detects a locked condition of a demodulator operating upon a plurality of signals that each have at least one discrete level that corresponds to one of a predetermined plurality of nominal points in a constellation plane, wherein the demodulator restores the plurality of signals by generating first and second quadrature demodulated signals for each of the plurality of signals that define a plurality of effective points in the constellation plane, each one of the plurality of effective points corresponding to one of the plurality of signals, the circuit comprising:

a first absolute value circuit that receives the first quadrature demodulated signal for each of the plurality of signals and generates a first absolute value of the first quadrature demodulated signal;

a second absolute value circuit that receives the second quadrature demodulated signal for each of the plurality of signals and generates a second absolute value of the second quadrature demodulated signal;

a comparison circuit, coupled to the first and second absolute value circuits, that receives the first and second absolute values and generates a maximum value and a minimum value for the first and second absolute values; and

a counter that is enabled to count according to a difference between the maximum value and a product of the minimum value and a multiplication factor, the counter having at least one output indicative of the locked condition.

15. (New) The circuit of claim 14, wherein the comparison circuit further comprises a subtraction circuit to subtract the first absolute value from the second absolute value to generate a phase error.

16. (New) The circuit of claim 14, wherein the circuit further comprises

a multiplication circuit that multiplies the minimum value and the multiplication factor to generate the product; and

a subtraction circuit that subtracts the product from the maximum value to generate the difference.

17. (New) The circuit of claim 14, wherein the counter is an up/down counter having a counting mode selected according to a sign of the difference between the maximum value and the product of the minimum value and the multiplication factor.

18. (New) A system for detecting a locked condition of a demodulator that operates upon a plurality of signals that each have at least one discrete level that corresponds to one of a predetermined plurality of nominal points in a constellation plane, the demodulator restoring the plurality of signals by generating a plurality of effective points in the constellation plane, each one of the plurality of effective points corresponding to one of the plurality of signals, the system comprising:

the demodulator; and

means for indicating the locked condition when a percentage of the plurality of effective points generated by the demodulator occurring in a plurality of reference areas in the constellation plane is within a range of probability for effective points to occur in the plurality of reference areas when the demodulator is in the locked condition, each of the plurality of reference areas being defined between two lines crossing an origin of the constellation plane .